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Relict Harvestmen from the Pacific Northwest

(Opiliones)

THOMAS S. BRIGGS

Galileo High School, San Francisco;
Field Associate, California Academy of Sciences, San Francisco 94118

The order Opiliones is divided into three suborders which differ from each other in a number of gross body structures. One such structure is an abdominal plate, the ninth tergite, which is usually present in two of the suborders but in the suborder Laniatores it is fused to an anal plate or absent. A series of peculiar Laniatorids collected in Oregon and Washington were found to have the free ninth tergite. Since reduction of sclerites has long been regarded as an important measure of specialization in arthropods, these phalangids should represent an early evolutionary stage closely allied to the other suborders of Opiliones.

Other primitive structures are borne by this series which belongs to the superfamily Travunoidea and is herein placed in the new family Pentanychidae. Three pairs of apparently vestigial lateral sclerites are located on the abdomen. No other Travunoids have been found to have lateral sclerites, but they appear in the United States species of the Laniatorid family Phalangodidae Simon. The hind claws of adults lack only one pair of branches from the typical six-branched claw of juvenile Travunoids, and the juvenile Pentanychids have an aroleum on their hind claws. Ontogenetic evidence from other members of Travunoidea indicates that six branches and an aroleum are found on the least specialized hind claws. The two Travunoid families that approximate this type of claw, Travuniidae Absolon and Kratochvil and Synthetonychidae Forster, have been regarded as relicts on the basis of their isolation, usually in caves, and their scarcity of individuals.

Degrees of specialization in the superfamily Travunoidea are diagramed (Fig. 1) and a phylogenetic relationship is proposed. The hypothetical ancestral Travunoid would have the greatest number of body sclerites and, possibly, the most complex claw. Oregon has provided the best data for this study and may well be the center of evolution for two families, Erebomastridae Briggs and Triaenonychidae Soerensen.

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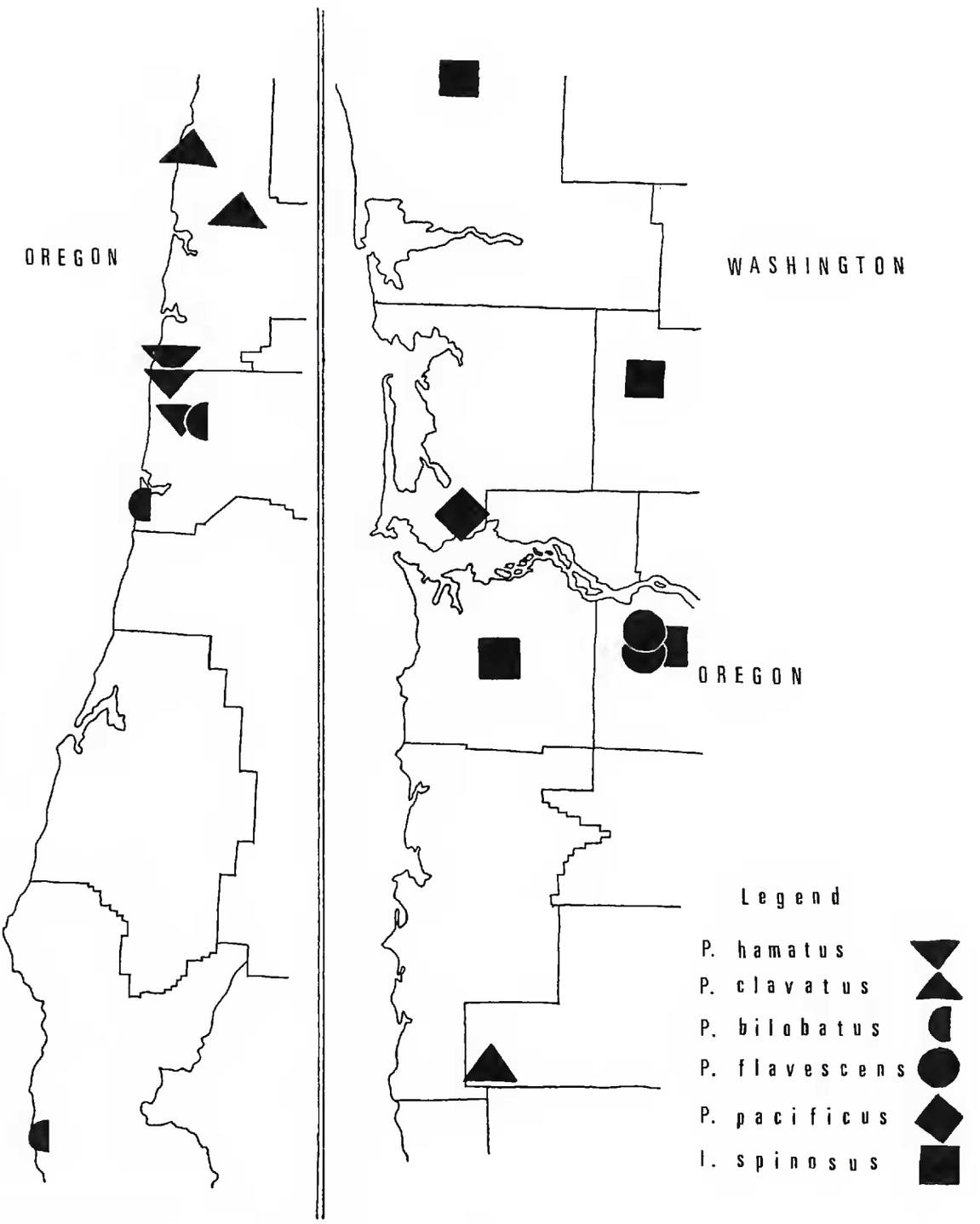


MAP 1. Distribution of Pentanychidae.

The North American Triaenonychids will be described in a separate paper in which a primitive subfamily, Paranonychinae, is established.

HABITAT AND DISTRIBUTION

The Pentanychidae are restricted to moist coastal forests where westerly winds prevent temperature extremes. These coastal forests of Oregon and Washington have over 50 inches of annual rainfall. The

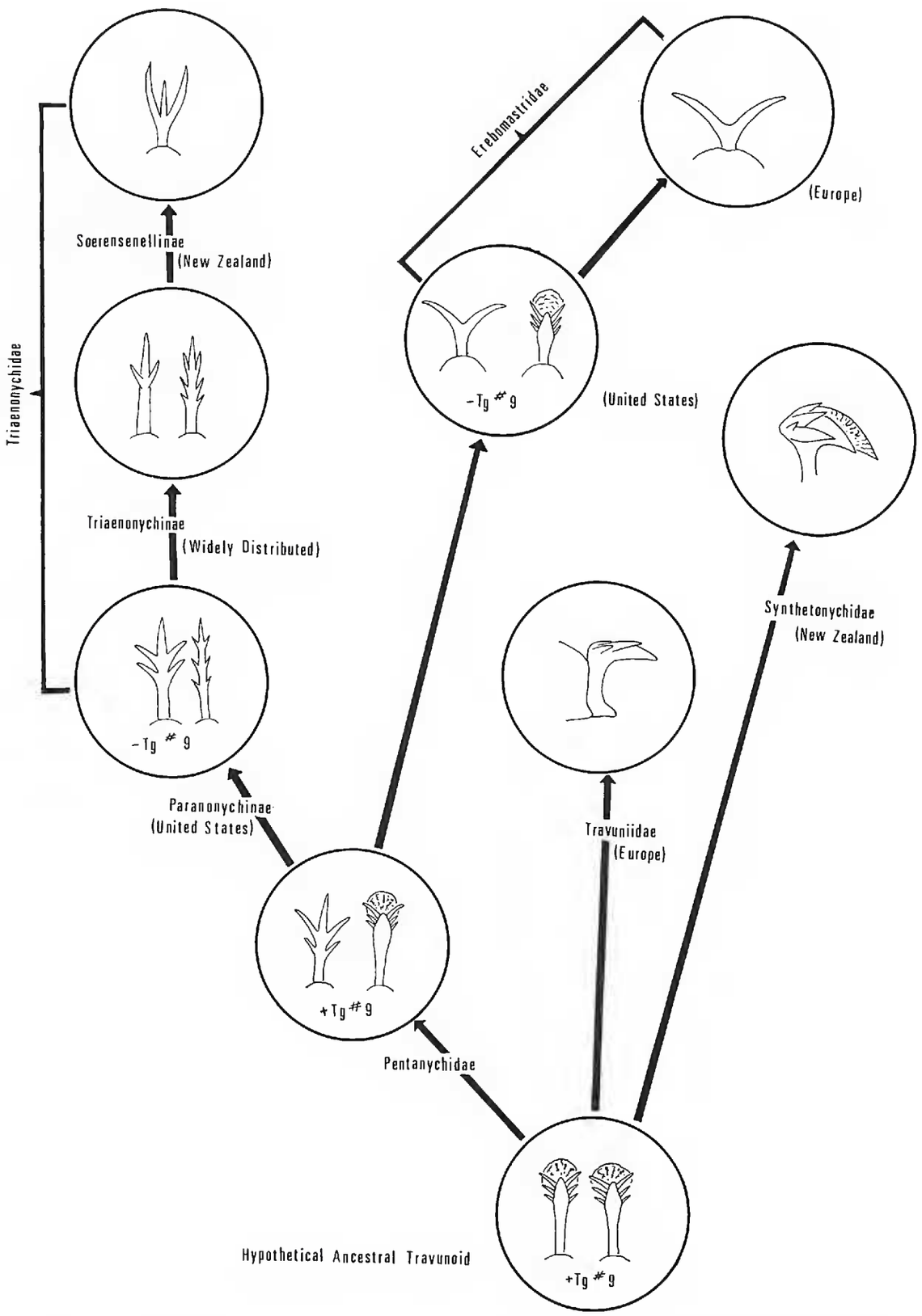
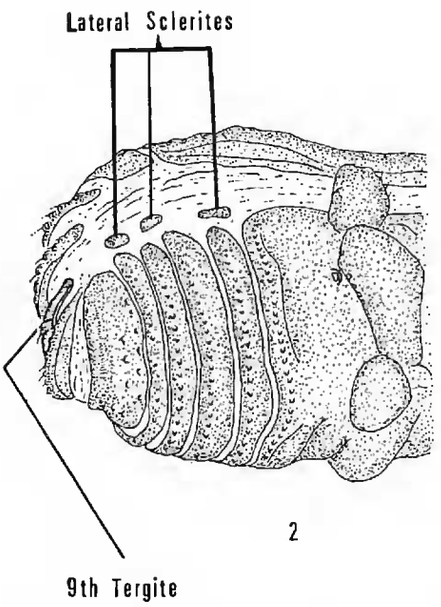


FIG. 1. Evolutionary relationships in superfamily Travunoidea with emphasis on reduction in the hind claw of adults and, where studied, of juveniles (right claw illustration). The presence or absence of a free ninth tergite (Tg #9) is indicated for some families. The stippled area on some claws is an aroleum. Travuniidae also has been reported from Japan and Korea.



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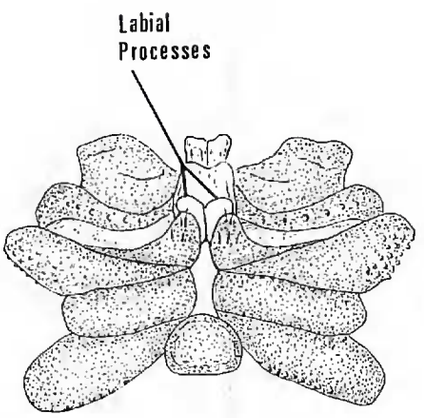

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FIGS. 2–3. Abdomen and sternal area of a typical female *Pentanychus*.

Pentanychids are always found deep under the rotting wood or fallen bark of a well-established stand of spruce and fir. It is unlikely that their habitat ever dries or freezes.

MORPHOLOGY AND DIMORPHISM

As previously discussed, additional sclerites characterize Pentanychids. The ninth tergite is broader than the anal plate but considerably smaller than the eighth tergite. The lateral sclerites are situated in folds of loose integument which makes them difficult to locate. These tergites and sclerites are best seen when severed from the cephalothorax and spread on a slide. Lateral sclerites may protect the loose integument from being punctured by the free sternites.

The sternal region is of considerable taxonomic importance in Pentanychidae. The sternum itself is broader than sterna of most other Travunoids. Anterior to the opercular opening and bordered by the base of the sternum is a slightly sclerotized, setose space similar to that found in some Erebomastridae and Paranonychinae of Triaenonychidae. It is usually above the anterior of the operculum. Anterior to the acute sternal apex is a region which separates Pentanychidae into two genera. In one genus, *Pentanychus*, this region contains two chitenized plates which join posteriorly along a midline and meet the apex of the sternum along a faint suture. Although these plates may have been referred to as maxillary processes by some workers, they will be called labial processes because they are distinct from the setose maxillary processes of the second coxae to which they are dorsally fused. Labial processes

are present in Triaenonychidae and some Erebomastridae. The labial processes of *Pentanychus* are unusually elongate anteriorly and extend above and ahead of the maxillary processes. The other genus, *Isolachus*, lacks visible labial processes and has the sternal apex enclosed by the maxillary processes of the second coxae.

In some species the male labial processes project forward as sharp, recurved spines and hooks. Another dimorphic structure of male Pentanychids is a peculiar set of ventral processes on their palpal femora which modify some of the ventral spines. Male specimens are absent from populations at the northern and southern extremes of the Pentanychid range. In each case extensive collecting only yields females.

All specimens are deposited in the collection of the California Academy of Sciences.

Pentanychidae Briggs, new family

Anterior margin of scute with recess above each chelicera bordered by spurs, three spurs present on margin. Eyes situated on median tubercle. Scute with five undivided areas. Abdomen with tergites six through nine separated by colorless integument, tergite nine always present. Small sclerotized plates (lateral sclerites) exist in soft integument dorsolateral to free tergites. Sternum broad, with setose zone near opercular opening. Palpi robust, with compound spines. Claws of third and fourth legs with two pairs of branches on uniform central prong. Juveniles with aroleum on anterior of six branched hind claws.

TYPE GENUS.—*Pentanychus* Briggs, new genus.

KEY TO GENERA OF PENTANYCHIDAE

1. Hind claws with ectodistal branch elongate, labial processes present ..... *Pentanychus* Briggs, n. gen.
   Hind claws with ectodistal branch equal to mesodistal branch, labial processes absent ..... *Isolachus* Briggs, n. gen.

Pentanychus Briggs, new genus

Scute with areas weakly delineated. Low, rounded eye tubercle deeply recessed from anterior margin. Sternum with acute apex.

Maxillary processes of second coxae elongate. Labial processes extending above and anterior to maxillary processes, dimorphicly elongated on some males. Spiracles exposed.

Sexual dimorphism of palpal femora pronounced, males with third ventral spine transformed into lobate process with distortion of remaining spines and swelling of dorsal margin.

Chelicerae with elongate basal segment and anterior spines.

First tarsi with five or six segments, second with more than ten. Distitarsi of first legs with two or three segments, of second with about six segments.

Femur of first leg with two small ventral spines, second trochanter with one. Claws on hind legs with two pairs of branches on central prong, posterior pair reduced, ectodistal branch greatly elongated.

Penis with broad, transparent ventral plate. Ovipositor with elongate distal lobes and lateral setae.

TYPE SPECIES.—*Pentanychus hamatus* Briggs, new species.

KEY TO MALES OF PENTANYCHUS

1. Labial processes apically elongated into recurved spines 2
   Labial processes apically blunt, downturned 3
2. Palpal femur with broad hump in place of third ventral spine ..... *hamatus* Briggs, n. sp.
   Palpal femur with clavate process at site of third ventral spine ..... *clavatus* Briggs, n. sp.
3. Palpal femur with first ventral spine on laterally flattened pedestal 4
   Palpal femur with first ventral spine on rounded pedestal ..... *bilobatus* Briggs, n. sp.
4. Palpal femur with pedestal of first ventral spine flattened perpendicular to plane of femur ..... *flavescens* Briggs, n. sp.
   Palpal femur with pedestal of first ventral spine flattened 45° to plane of femur ..... *pacificus* Briggs, n. sp.

Pentanychus hamatus Briggs, new species

(Figs. 6a, 6b, 10–18)

MALE.—Total body length, 2.14 mm. Scute length, 1.73 mm. Length of eye tubercle, 0.17 mm. Scute width, 1.68 mm. Length of second leg, 4.88 mm. Width of eye tubercle, 0.27 mm.

Anterior margin of scute with slightly truncate shoulders. Scute with light shading of black pigmentation, integument yellow to orange. Areas demarked by low tubercles. Tergites with same coloration as scute, each with row of tubercles.

Maxillary processes enclose cavity anterior to sternal apex. Labial processes in the form of acute spurs bearing large, recurved apical spines. Several seta-bearing tubercles on ectoposterior of second coxae. Lateral sclerites adjacent to fourth, sixth, and seventh sternites.

Chelicerae with lobate basal processes on fingers.

Palpal femora each with broad hump bearing proximal spur in place of third ventral spine, dorsal spines reduced and evenly spaced. Apical claws of palpi thickened basally.

Tarsal formula 6-13 to 15-4-4. Legs lightly dusky, lightest at tarsi.

Penis with aedeagus projecting through acutely convex margin of transparent ventral plate.

FEMALE.—Without altered palpal femora or labial spines. Maxillary processes of second coxae laterally compressed and elongate. Palpal claws and fingers of chelicerae normal. Lateral sclerites free. Labial processes apically blunt, downturned.

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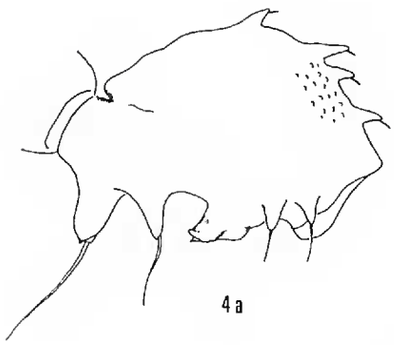
FIGS. 4–9. Ectal view of palpal femora of Pentanychidae. FIGS. 4a–4b. Male and female *Pentanychus flavescens*. FIGS. 5. Female *Isonychus spinosus*. FIGS. 6a–6b. Female and male *Pentanychus hamatus*. FIGS. 7a–7b. Male and female *Pentanychus bilobatus*. FIGS. 8a–8b. Female and male *Pentanychus pacificus*. FIGS. 9a–9b. Male and female *Pentanychus clavatus*.



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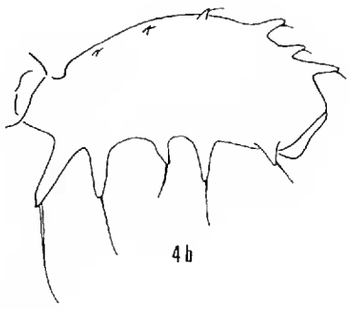

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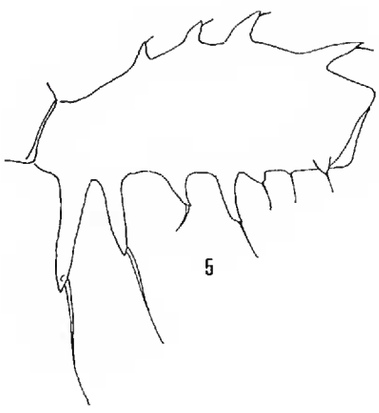

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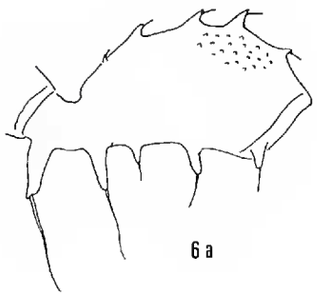

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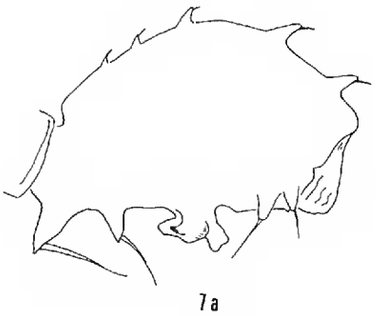

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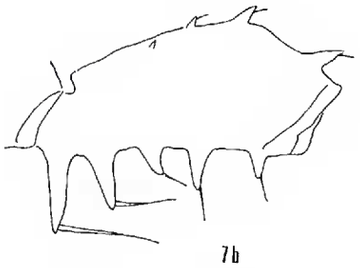

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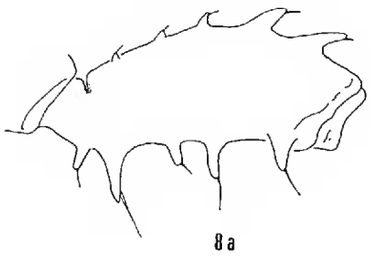

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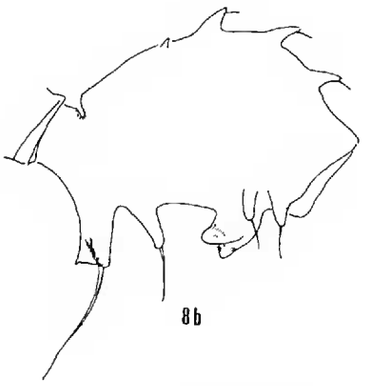

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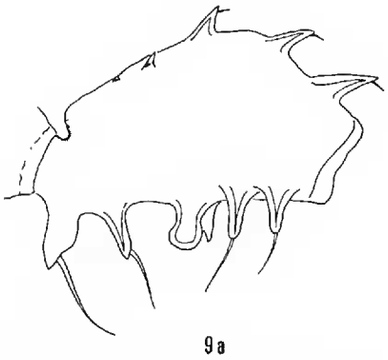

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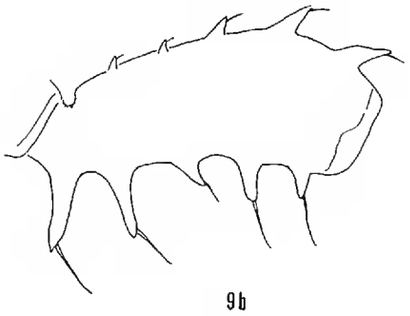


9b

Holotype male and allotype, NEPTUNE STATE PARK ON U.S. HIGHWAY 101, LANE COUNTY, OREGON, 20 June 1966, K. Hom.

OTHER LOCALITIES.—Oregon. Lane County: 0.3 mile and 1.2 miles east Highway 101 on Cape Creek Road near Hecata Head, 3 and 4 September 1970, T. Briggs, K. Hom, R. Lem, W. Lum, and J. Tom. Lincoln County: 0.5 mile east Cape Perpetua on U. S. Highway 101, 7 August 1967, T. Briggs.

NOTE.—Pigmentation on posterior of scute is of variable darkness.

Pentanychus clavatus Briggs, new species

(Figs. 9a–9b)

MALE.—Total body length, 1.88 mm. Scute length, 1.56 mm. Length of eye tubercle, 0.28 mm. Scute width, 1.44 mm. Length of second leg, 5.23 mm. Width of eye tubercle, 0.23 mm.

Anterior margin of scute with shoulders slightly truncate. Scute with faint marbled pattern of black pigment fading anterior to eye tubercle. Marbled pattern terminates in circle of black pigment inside of posterior margin of scute. Areas demarked by low tubercles. Tergites with light band of black pigment and band of tubercles. Eyes dark without black pigment between. Integument yellow.

Maxillary processes of second coxae elongate. Labial processes with small, recurved apical spines. Mesoanterior margins of third coxae with gland opening. One tubercle on ectoposterior of second coxa. Anterior lateral sclerites touch sternies.

Chelicerae with anterior spines directed mesally.

Palpus with clavate lobe and mesal spur in place of third ventral spine on femur, dorsal spines prominent. Palpal claws thickened basally. Palpi lightly pigmented, lightest on tarsi.

Tarsal formula 6-13 to 15-4-4. Legs with dusky black pigment, lightest on tarsi.

Penis with aedeagus projecting through concave anterior margin of ventral plate.

FEMALE.—Similar to male but without modified palpal femora. Labial processes not hamate. Lateral sclerites free.

Holotype male and allotype, 7.7 MILES NORTHWEST EDDYVILLE, LINCOLN COUNTY, OREGON, 20 June 1966, T. Briggs, V. F. Lee, and K. Hom.

OTHER LOCALITIES.—Oregon. Lincoln County: 0.5 mile north of Depoe Bay on U. S. Highway 101, 4 September 1970, T. Briggs, K. Hom, R. Lem, and W. Lum. 1.3 miles east U. S. Highway 101 at Taft, 7 August 1967, T. Briggs. Yamhill County: 10.7 miles northwest Valley Junction, 27 August 1969, T. Briggs.

Pentanychus bilobatus Briggs, new species

(Figs. 7a–7b)

MALE.—Total body length, 2.22 mm. Scute length, 1.56 mm. Length of eye tubercle, 0.27 mm. Scute width, 1.48 mm. Length of second leg, 5.70 mm. Width of eye tubercle, 0.23 mm.

Anterior margin of scute with truncate shoulders. Scute dusky posterior to eye tubercle, with pebbled pattern in median zone behind tubercle. Areas demarked

by darker tubercles. Tergites dusky, with band of tubercles. Integument yellow to orange.

Maxillary processes of second coxae stout. Labial processes with blunt, hamate apices. Second coxae with many seta-bearing tubercles on ectoposterior. Lateral sclerites free.

Chelicerae with normal fingers.

Palpal femur with broad hump bearing proximal spur and distal spur in place of third ventral spine, dorsal spines normal. Palpal claw uniform.

Tarsal formula 5 to 7-13 to 15-4-4. Legs darker than body, lightest at tarsi.

Penis with aedeagus projecting through convex anterior margin of narrow ventral plate.

FEMALE.—Similar to male, but without altered palpal femora.

Holotype male and allotype, HONEYMAN STATE PARK, LANE COUNTY, OREGON, 19 and 20 June 1966, T. Briggs and V. Lee.

OTHER LOCALITIES.—Oregon. Curry County: 4.5 miles south Gold Beach, 19 June 1966, 29 January 1967, 3 February 1969, and 4 September 1970, V. F. Lee, K. Hom, R. Lem, W. Lum, and T. Briggs. Lane County: 0.3 mile and 1.2 miles east U. S. Highway 101 on Cape Creek Road near Hecata Head, 3 and 4 September 1970, T. Briggs and K. Hom.

NOTES.—Specimens of *Pentanychus bilobatus* from Gold Beach, Curry County differed slightly from northern specimens in the position of spines on the palpal femora. Extensive collecting at different times of the year only yielded females of this population.

Pentanychus flavescens Briggs, new species

(Figs. 8a–8b)

MALE.—Total body length, 1.94 mm. Scute length, 1.50 mm. Length of eye tubercle, 0.13 mm. Scute width, 1.37 mm. Length of second leg, 5.29 mm. Width of eye tubercle, 0.17 mm.

Anterior margin of scute with rounded shoulders. Scute without black pigment, integument light yellow. Areas with rows of small tubercles. Tergites without black pigment, row of small tubercles on each. Eye tubercle small, eyes present.

Lateral sclerites pale, free. Maxillary processes rounded, with stout, hamate labial processes. Second coxae with uniform cover of small tubercles.

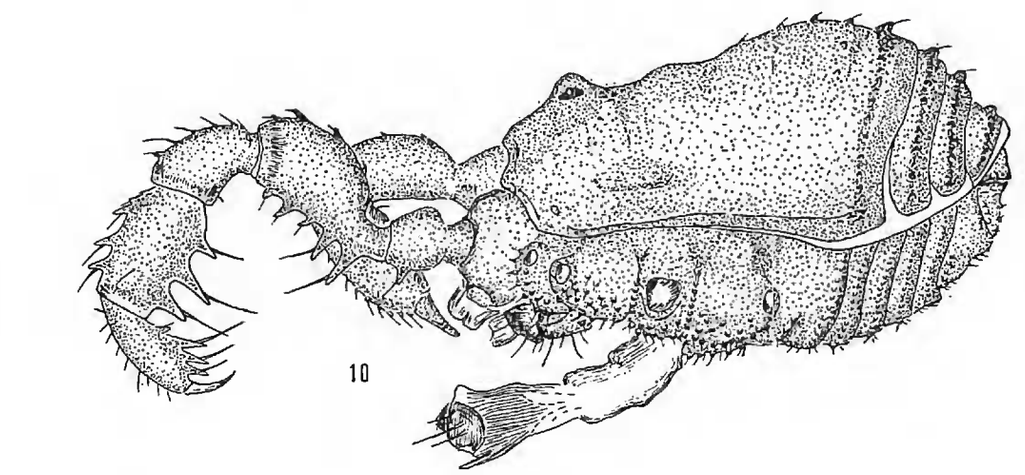
Palpal femur with broad hump-bearing proximal spur in place of third ventral spine, first ventral spine mesal on stout, frontally compressed pedestal, dorsal spines grouped distally.

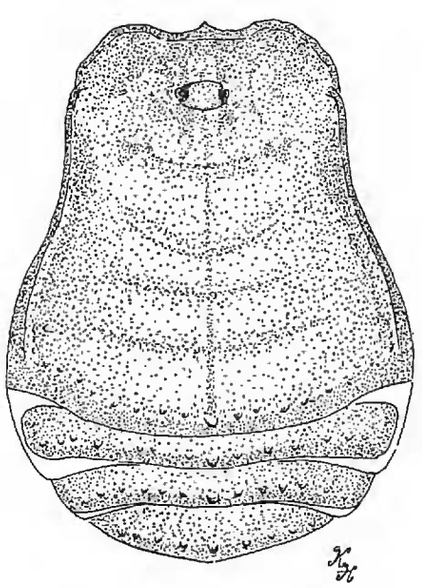
Tarsal formula 5 to 6-13 to 15-4-4. Legs without dark pigment.

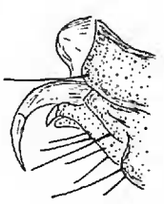
Penis with aedeagus not projecting beyond rounded distal margin of ventral plate. Distal half of ventral plate transparent.

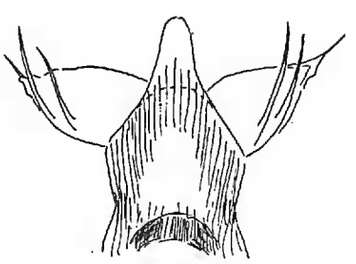
FEMALE.—Palpal femora normal, labial processes thin, not hamate. Maxillary processes of second coxae elongate. Dorsum of palpal femur with six spines in ectal view. Ovipositor with stout lateral setae.

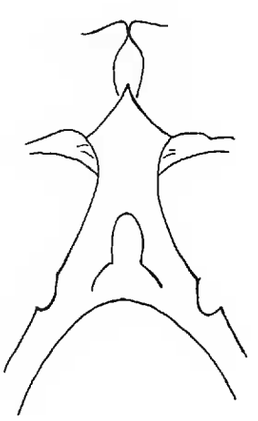
Holotype male and allotype, 5.8 miles south Clatskanie, Columbia County, Oregon, 8 August 1967, K. Hom.

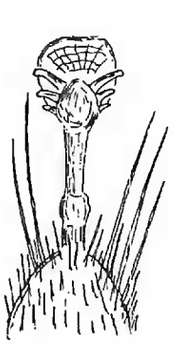












FIGS. 10–18. *Pentanychus hamatus* Briggs, new species. FIG. 10. Lateral view of female. FIG. 11. Labial process of male. FIG. 12. Ventral view of ovipositor. FIG. 13. Dorsum. FIG. 14. Sternum of male. FIGS. 15–16. Ventral and lateral views of penis. FIGS. 17–18. Dorsal and lateral views of juvenile hind claw.

OTHER LOCALITIES.—Oregon. Columbia County: 5.5 miles south Clatskanie, 8 August 1967, T. Briggs.

NOTE.—Half of the specimens examined lacked both retinae. This species displays the only example of blindness in Travunoidea for America. Non-cavernicolous blindness is also found in California in the family Phalangodidae of Oncopodoidea.

Pentanychus pacificus Briggs, new species

MALE.—Total body length, 1.87 mm. Scute length, 1.56 mm. Length of eye tubercle, 0.27 mm. Scute width, 1.36 mm. Length of second leg, 4.97 mm. Width of eye tubercle, 0.23 mm.

Scute dusky posterior to eye tubercle with pebbled pattern in median zone behind tubercle. Eyes normal. Areas demarked by small, darker tubercles. Tergites dusky, with bands of tubercles. Sternum broad, rod-shaped. Maxillary processes of second coxae pigmented. Labial processes hamate. Second coxae uniformly covered with small tubercles. Lateral sclerites pale, free.

Palpal femora each with stout process bearing mesal and ectal spurs in place of third ventral spine, first ventral spine mesodistal on stout pedestal compressed 45° to plane of femur, dorsal spines not closely grouped. Palpi dusky.

Tarsal formula 5 to 6-13 to 15-4-4. Legs dusky, lightest on tarsi.

Penis with aedeagus not projecting beyond rounded distal margin of transparent ventral plate.

FEMALE.—Maxillary processes of second coxae elongate and apically rounded. Dorsum of palpal femur with five spines in ectal view. Labial processes thin, not hamate.

Holotype male and allotype, 5.9 MILES EAST ASTORIA BRIDGE NEAR KNAPPTON, PACIFIC COUNTY, WASHINGTON, 26 August 1969, T. Briggs.

Isolachus Briggs, new genus

Scute with areas weakly delineated. Rounded eye tubercle deeply recessed from anterior margin. Sternum with acute apex. Labial processes absent. Spiracles exposed.

Chelicerae with elongate basal segment and anterior spines.

First tarsi with five or six segments, second with more than ten. Distitarsi of first legs with two or three segments, of second with about six segments.

Femur of first legs with small ventral spines. Claws on hind legs with two pairs of equal branches on central prong, posterior pair reduced.

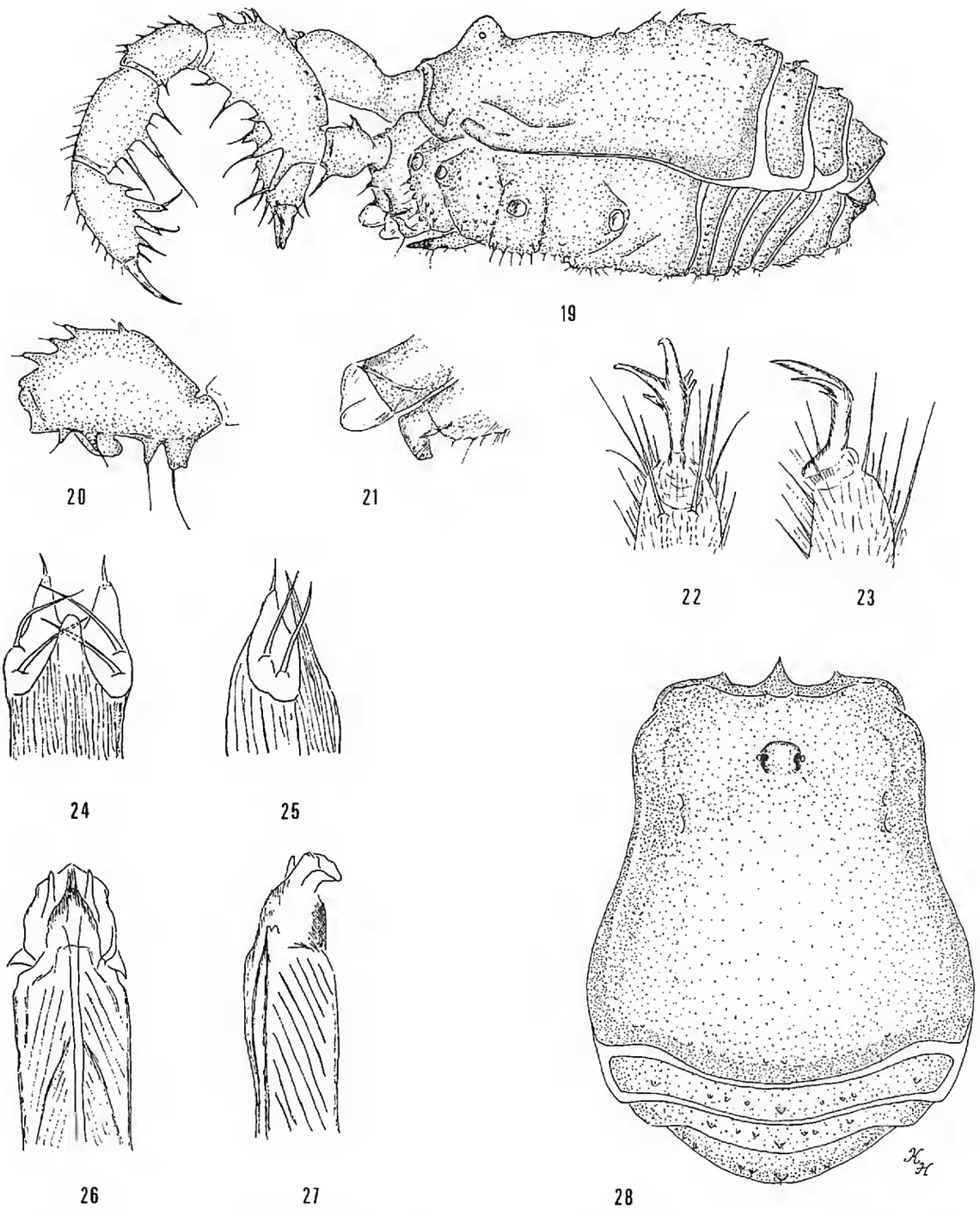
Ovipositor with elongate distal lobes and lateral setae.

TYPE SPECIES.—*Isolachus spinosus* Briggs, new species.

Isolachus spinosus Briggs, new species

(Figs. 5, 21–35)

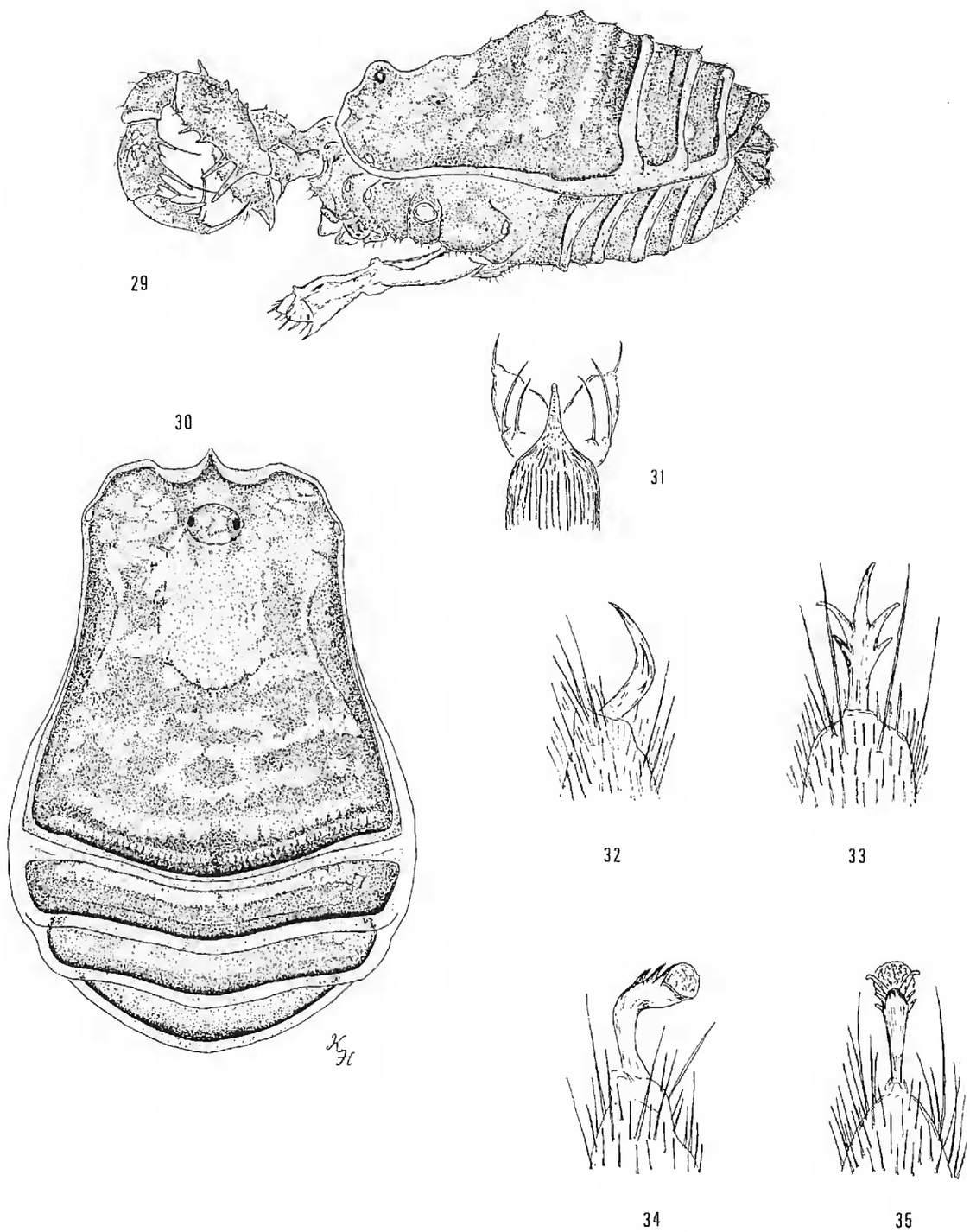
FEMALE.—Total body length, 28.0 mm. Scute length, 2.26 mm. Length of eye tubercle, 0.28 mm. Scute width, 2.14 mm. Length of second leg, 7.39 mm. Width of eye tubercle, 0.31 mm.



FIGS. 19–28. *Pentanychus flavescens* Briggs, new species. FIG. 19. Lateral view of female. FIG. 20. Ectal view of male palpal femur. FIG. 21. Lateral view of labial process of male. FIGS. 22–23. Dorsal and lateral views of right hind claw. FIGS. 24–25. Ventral and lateral views of ovipositor. FIGS. 26–27. Ventral and lateral views of penis. FIG. 28. Dorsum of sighted specimen.

Anterior margin of scute with rounded shoulders. Scute mottled throughout with black pigment, region posterior to eye tubercle lightest. Areas with rows of small tubercles. Tergites smooth, each with band of dark pigment. Sternum broad, rod-shaped. Venter, excluding sternum, dusky. Lateral sclerites free.

Maxillary processes dark, acute lobes bearing coarse setae. Second coxae with small tubercles on ectoposterior.



FIGS. 29–35. *Isolachus spinosus* Briggs, new species. FIGS. 29–30. Lateral and dorsal views of female. FIG. 31. Ventral view of ovipositor. FIGS. 32–33. Lateral and dorsal views of hind claws. FIGS. 34–35. Lateral and dorsal views of juvenile hind claw.

Chelicerae without prominent tooth on fixed fingers. Palpi with robust spines, palpal femora each with prominent anterodorsal spine.

Tarsal formula 5 to 6-13 to 15-4-4. Legs, including tarsi, darker than body. Tarsal claw of hind legs with nearly equal distal branches.

Ovipositor with narrow ventral lobe.

MALE.—Unknown, may not exist.

JUVENILES.—Integument without dark pigment.

Holotype female, 1 MILE SOUTH SADDLE MOUNTAIN STATE PARK, CLATSOP COUNTY, OREGON, 7 August 1967, T. Briggs and A. Jung.

OTHER LOCALITIES.—Oregon. Clatsop County: 1 mile south Saddle Mountain Park, 5 September 1970, T. Briggs, K. Hom, R. Lem, and W. Lum. Columbia County: 5.5 miles south Clatskanie, 8 August 1967, T. Briggs. Washington. Grays Harbor County: 6.8 miles south Neilton, 22 June 1966, T. Briggs, V. F. Lee, A. Jung, and K. Hom. Lewis County: Rainbow Falls State Park, 25 August 1969, T. Briggs.

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FIRST INTERNATIONAL CONGRESS OF SYSTEMATIC AND EVOLUTIONARY BIOLOGY

The Society of Systematic Zoology and the International Association for Plant Taxonomy have joined forces to develop this first opportunity for botanical/zoological interaction at the international level. The University of Colorado (Boulder, Colorado) has extended a gracious invitation to meet on that campus 4–11 August *1973*. The diversity of ecological situations in the surrounding countryside makes this one of the most attractive sites in North America, both aesthetically and scientifically. The presence of experienced, enthusiastic biologists on that campus also provides an indispensable ingredient for the success of this Congress.

To begin the planning phase, two committees have been appointed by the sponsoring organizations, a Steering Committee and an International Advisory Committee. The Steering Committee will be the principal organizing group. The International Committee will provide valuable advice and guidance in the development of the Congress and it is recognized by the International Union of Biological Sciences as the special working group responsible for this event.

Program plans at this point encompass interdisciplinary symposia and contributed paper sessions. The botanists will not convene a nomenclatural section but a zoological one on this subject is anticipated. In the next few months the outline of the program and other activities will begin to take form. All suggestions will be gratefully received, carefully considered, and as many adopted as practical or feasible. Correspondence may be addressed to any member of the Steering Committee (e.g., Dr. Paul D. Hurd, Jr. (Co-Chairman, Program Committee) Department of Entomology, Smithsonian Institution, Washington, D. C. 20560) but preferably to the Secretary: Dr. James L. Reveal, Department of Botany, University of Maryland, College Park, Maryland 20740.